

# POPULAR **Computing** WEEKLY

30 APRIL 1982, 16.57p No. 1

**30p**

**Space Amaze  
on ZX 81**

**Six pages of  
ZX 81,  
VIC, and  
BBC programs**

**Cassettes tested  
Micro music**

**and much,  
much more**

**Win a ZX 81  
Printer**

# EXPAND YOUR VIC



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## ARFON PRINTER

A new 8011 stand alone printer which will be almost essential for your larger programs will be launched in the Spring of 1982. The power plug for this unit is already in your expanded system.

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# AM

# POPULAR Computing WEEKLY

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### How to submit articles

Articles which are submitted for publication should not be more than 2,000 words long.

If you are writing for a particular section, such as Programming, you should try to cover the ground in about 1,000 words.

All submissions should be typed and a double space should be left between each line.

Programs should whenever possible be computer printed.

We cannot guarantee to return every submitted article. Popular Computing Weekly can accept no responsibility for any errors in programs or publication, although we will always try our best to make sure programs work.

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## Editorial

IT IS now almost most certain that a new Sinclair computer will be launched before the summer, or very shortly after.

This will be an exciting development which could cement Clive Sinclair's prominent position in the home computer market. So far he has looked rather vulnerable to competition from the multinationals.

As we report in our News section, Clive's new computer — the Spectrum — will probably cost about £170, come with 32K of memory and have full sound and colour.

We do not yet know how far the version of Basic used in the computer will be compatible with the ZX81.

It is important that Clive should make every effort to ensure that ZX81 programs, written in either Basic or machine code, should be able to run without significant alteration on the new computer.

If the ZX81 were to be rendered obsolete, it would be a great blow to all of those people who have recently bought this model.

## Next Week



How would you rate an alien planet? In next week's fantastic issue the program that tells you how.



## The ZX82 is near!

LIVE SINCLAIR is in the form of launching its new computer. The machine will probably be sold under the trade name 'Spectrum' but for the moment is code-named 'Z82' within Sinclair Research.

The price of the Z82 is expected to be about £170 — considerably higher than the Z80 (£149.95) or the Z88 (£295).

(Z80) But an 8-bit unit, should prove well worth the money and will make it a serious contender for the Windows 1 computer for home users.

The Z82 is a significant step forward from the Z80 in that it will offer colour graphics, and have a mechanical keyboard with dual control in a keypad. The mechanical keyboard of the Z80 proved

unusable for many users, but the new design should put an end to these demonstrations.

The memory of the Z82 will be capable of expansion to 256K — soon by many users is necessary, rather than merely desirable.

Compatibility with earlier Sinclair machines has yet to be confirmed.

## Third ZX Microfair promises to be biggest yet, says organiser

The third ZX Microfair will be held at Westminster Central Hall on Friday April 24 and Saturday May 1.

More than 70 suppliers of hardware and software for the Sinclair ZX computers have taken stands at the show, according to the organiser Mike Johnston.

We are having great difficulty in squeezing in everybody who wants to show their wares in," said Johnston. But we will be making more space available than at previous Microfairs, so visitors will be able to see a very wide range of offers.

About 40% of the exhibitors will be showing hardware products, including a number of high quality RAM packs. Software will be demonstrated on a 10-drive which allows



Mike Johnston — micro-fair

up to four cassettes and a printer to be attached to the Z80, while Ah Pentel will show a mini keyboard to fit over the Z80.

Admission will be 40p for adults and 20p for children, and the exhibition will be open from 12.30 pm to 5.30 pm on the first day and from 10.00 am to 5.00 pm on the second.

For those who wish to make absolutely sure that they will get in, advance tickets are available for the Friday, since £1 for adults and 50p for children. You can obtain these from Mike Johnston, Organiser, ZX Microfair, 71 Park Lane, London W1B 6HD.

Johnston is also organising a ZX Microfair to be held at Manchester on Saturday May 25 and Sunday May 26 at the New Century Hall in Corporation Street.

Times of opening are 10.00 am to 4.00 pm on the first day and 10.00 am to 5.00 pm on the second.

## Commodore is having a baby

Business have been filtering through the press lately with regard to new machines coming out of the Commodore factories. Let's take a look at the current and smallest of these, the Ultamax.

Ultamax has a UK selling price of £199.95 so we can expect a UK price of something like £200. Delivery dates are not quite as clear, some dealers are quoting mid-summer, but from past experience we shouldn't expect any great quantities and somewhere about Christmas.

Random memory will be 256K or 512K (see-once memory quite rare at the moment), with an additional 64K expansion cartridge becoming available at some point. However, as only one cartridge can be plugged in at a time, and basic comes on — you guessed it — a plug-in cartridge memory expansion seems a bit casual.

All this is said subject to change, as things may be different when the machine appears in large quantities.

## See us at the Computer Fair

The first of the major home computer exhibitions this year is the Computer Fair, running at London's Earl's Court on April 22-23.

Popular Computing Weekly will be exhibiting at the fair on stands 305 and 405.

The Computer Fair is an exhibition through by IPC, the large publishing company, to break into the market for home computer exhibitors. To date this has been dominated by the Personal Computer World Show, held at the arena.

One of the key attractions of the Computer Fair is the ZX Village in which most of the companies supplying software and hardware will show for the Z80 will be exhibiting.

## Monolith plans a £200 disc drive for Sinclairs

At last you'll be able to use the services with the Z800 when Monolith launches its floppy disc unit for the Sinclair machine probably in June.

The unit will cost about £200 each, according to Monolith director Rod Hutton. He believes this will prove attractive to both home and small business users such as shopkeepers, who could use the device for applications like stock control and accounting.

The drive, as at present

undergoing final tests, but Hutton is confident that this will be completed by June at the latest of the launch.

We are already taking orders on a deposit basis but as yet we haven't decided whether to make the device available through dealers," said Hutton. But because we're selling on bank, right price means to keep the price down we're likely to jump for direct mail sales only.

Now Sinclair will want to see new machines is still unclear. Hutton does not intend to recommend any particular disc drive, and a spokesman for the company. We are interested in selling a drive under our own brand name, either making it ourselves or buying it from another supplier. We've had a number of discussions about this with companies including Rodime, but as yet have come to no decision about this.



# Club Reports

Is your club involved in any special projects? Use this page to tell the world about it

## In a jam? The BBC can help you get unstuck

*David Kelly looks at the BBC Referral Service for micro users*

THE BBC Computer Referral Service has been set up as an information exchange to put you in touch with someone who can give you an answer to seemingly insoluble problems about your micro.

The popular BBC tv series *The Computer Programme* is only one aspect of an ambitious scheme to provide assistance to microcomputer users. The whole scheme goes by the title *The BBC computer literacy project*, and includes the BBC micro a book, a software library, a 30-hour Basic 'flaxcourse' specially designed for the BBC by the National Extension College and, most important, the Referral Service to put interested groups and individuals in touch with each other.

The Referral Service will make it possible for those whose interest has been fired by the tv programmes of the book to follow them up and learn more.

Broadcasting Support Services handle the day-to-day running of the service. Broadcasting Support Services is a charity, funded by the BBC, and located in West London. Set up originally as a back-up facility for the *On the Move* adult literacy series, it now provides support for a wide range of BBC programmes.

### A mountain of inquiries

The Referral Service has been up and running since January this year, and staff at Broadcasting Support Services have been busy sorting through a mountain of over 73 000 inquiries that the Computer Literacy Project has so far received. Each inquiry is referred for help to the nearest and most relevant of more than one thousand referral points dotted all over the country.

These referral points offer many different facilities. Any group offering advice can be based on the system as a micro help centre. The only conditions asked of those on the list are that the service provided is independent of



A print-out goes to each requester

suppliers and that the advice given is impartial.

Of the 1163 referral points currently on the list, some 500 are colleges offering teaching facilities — many run the 30-hour National Extension College flaxcourse in Basic, designed for use with the BBC micro.

About 80 of the referral points are the approved service outlets for BBC micro advice, and the remainder are clubs and user groups. Included on the list are the British Computer Society (BCS) clubs, the Amateur Computer Clubs and about half of the 30 or so Computer Town UKs.

The Referral Service is not limited to providing information about the BBC micro. The referral points will give information about all aspects of micro-computing, and can give advice on any system in existence.

In fact, they have only one thing in common — their desire to help. One of the referral points is a fruit farm in Spalding that opens its doors to anyone who wants a go on its micro.

Unfortunately many referral points which have sought to obtain a BBC micro have still not been able to do so, despite being placed on a 'priority list'.

So what happens when you write to the Referral Service? How can your letter — one of 500 that week — receive a reply within 10 days?

You guessed it — the system has been computerised.

All the referral points are stored on a computer master file. Details of each letter received are entered in code, giving the name and geographical location of the sender and the information requested.

Key codes by subject will provide information about such matters as courses for beginners, computer clubs in the vicinity of the inquirer, or the location of the nearest BCS club.

The computer then produces, for every inquiry, a print-out listing the relevant referral points in the inquirer's area. Each referral point is listed by name, location, contact name, address and phone number, together with details of what facilities are offered. In the case of clubs, details of meetings are also given.

A typical entry might include such details as shown in the illustration.

### Wide range of information

In addition to the print-out the inquirer is sent a list of national clubs and — where appropriate — information on computer careers and on micro for small businesses. Leaflets about the use of micros in the construction industry and legal profession are in preparation together with a short bibliography. The Amateur Computer Club and Computer Town UK organisations hope to produce leaflets on how to set up a club or Town.

The BBC Referral Service has been in business for three months, and already has over 1000 referral points. So if you think your group could be a referral point, or if you wish to make additions or corrections to the BBC information, write enclosing a 10p x 9cm stamped addressed envelope to BBC Computer Referral Service, Broadcasting Support Services, PO Box 7, London W2 6XJ.

Write to Club Reports, Popular Computing Weekly, Posthouse Court, 19 Whitcomb Street, London WC2 7HF, with details of successes you have had with your club, with ideas for helping clubs along and with any news of special meetings. We look forward to hearing from you.

# Space Amaze

How to play this amazing space freedom game  
 Invented by Dave Middleton.

IN THE DEPTHS of space surrounding the interstellar shipping lanes of the planet Urth a desperate battle is being fought. The shipping lanes must be kept clear of space mines being dropped by the evil Zaxons.

Your duty as a space rookie is to attack the Zaxon ship which is laying mines in your quadrant of space.

The Zaxon ship cannot be destroyed, but if you can ram the ship before the mine can be released then it will drop back into hyperspace and appear at another position in your quadrant. Just before the mine is released the Zaxon ship changes

shape, giving you a chance to avoid the mine.

Your cruiser can withstand the impact of three space mines before you have to return to Urth for a refit. Promotion is in order depending on your skill at harassing the Zaxons.

The Zaxons are lazy, but as you ram the ship they tend to become more active and you will get less time to approach before the mine is released if you disturb the Zaxons enough they get annoyed and scatter

five mines without dropping from hyperspace, but this fees them so they slow down again.

To control your cruiser press the cursor keys and the ship will move in the direction indicated. Your cruiser is programmed to remain in your assigned quadrant.

## The program

Space Amaze uses an array to hold information about the contents of the screen. An array element can have three states: 0 indicating unoccupied, 1 occupied by a mine, and 2 occupied by the alien ship. The current position of the alien ship is given by *ax* and *ay*.

Your ship is controlled by the Z801 cursor control keys. To enable the ship to continue moving even when a key has not been pressed, the variable *dx* is used (lines 520-545). When





a legal key is pressed `ds` changes state, but only if the ship is not at the edge of the screen (lines 550-560).

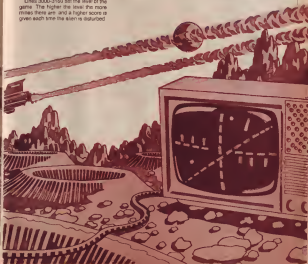
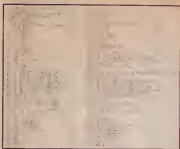
Note that the original values of `x` and `y` are saved before the position on the screen is updated, thus allowing the ship to be deleted and then re-plotted immediately, resulting in only slight screen flicker.

With each pass through the loop between lines 520-570 a counter is decremented. When `t=0`, the alien is moved to another random position on the screen. When `q(x,y)` the routines at 1030 or 2030 are accessed.

Lines 1030-1045 delete the alien from the screen and the array. The countdown limit `ls` is also decremented and when this is 30 the player is moved to the next level.

The segment 2030-2050 destroys a shield `sh` on the ship causing the appropriate message to be displayed at the top of the screen. If `sh=0` then the game ends with an appropriate message.

Lines 3000-3150 set the level of the game. The higher the level the more mines there are, and a higher score is given each time the alien is disturbed.



# Reviews

## software

### Canyon Fighter

The Vic Centre, 154 Victoria Road,  
London W5  
Cassette, price £5.95.

This is one of many games programs for the Commodore Vic 20 on the market at present.

The basic idea of the game is a simple one: you are the pilot of a spaceship making its way down a canyon, with the ability to steer left and right as it snakes along its path.

To make life more hazardous, various 'enemies' put in an appearance from time to time, with increasing regularity as the game progresses.

To aid you in your battle through the canyon, you have a laser which can be used to destroy the enemy craft, and any debris that gets in your way.

However, your laser is not powerful enough to penetrate the walls of the canyon, so you discover when you crash into it, still frantically trying to live!

The game gets more and more difficult the longer it goes on, until it becomes virtually impossible to get through the canyon, as the walls close in on you the further down you go.

There are 10 levels of play, and, as you reach goals, the higher the level, the harder it is to play. The walls seem narrower, more enemies keep on appearing, more space debris gets in the way and the whole thing generally becomes more chaotic.

It is a way of getting high scores however!

As in most games of this nature, it is decidedly simple to play, but correspondingly difficult to master. Only three keys control movement and firing, but as the game gets more difficult you will seem to run out of fingers. (As a general rule to game writers, don't write games which require ten fingers to operate!)

Moreover, unlike games like *Invaders*, where a pattern soon becomes recognised and you learn how to build up a very high score without really thinking about it, *Canyon Fighter* does not repeat itself, and you have to keep your attention on the game all the time.

Consequently, generating enormous scores is not that easy, and at



no point do you know what is going to happen to your spaceship next!

### Summary

It's good to see a program actually making use of the powers of the machine it's written for. Needless to say, it also makes excellent use of the Vic's colour and sound capabilities.

The only complaint is the inevitable one: documentation. The user must discover for himself which keys perform what action.

### Peek, Poke, byte and RAM!

By Ian Stewart and Robin Jones,  
published by Shiva Publishing, 113  
pages paperback, price £4.95

There are many, many folk around who buy a Sinclair ZX81 with great enthusiasm and then get stuck on how to use it. The manual is very good in comparison with most — but is still a struggle for the real novice.

The user groups and magazine articles give great help — but almost entirely for those who have some knowledge. The hundreds of adverts scream 'what you've been waiting for, but their wares can do no more than amuse the beginner.

In fact the number of books aimed at the ZX user is now well over 50 — but most of those claiming to be designed for the beginner are poorly presented and/or not very well written.

This book is a glorious exception. What it does is take the reader gently but meaningfully through the material covered in the manual. The jokes begin right from the start — with a picture of Richard Baker on screen saying, 'No, you've left it turned to BBC 1.' From then on the pages are filled with useful comment and relevant little programs.

Finally, this is a real book — properly printed and bound. The cover is by

John Harris, the same artist (and the same theme) as used by Sinclair themselves.

I have only one quibble with this otherwise outstanding introduction to ZX81 programming — that the character 'pi' is used for zero. Trivial, I know, but it jogs on the beginner.

### Summary

Far and away the best book for ZX81 users new to computing.

### French Countdown

Published by AVC Software, PO Box  
415, Birmingham B7  
ZX81 16K, Cassette, price £3.00

This is a recent addition to AVC's Countdown series of ZX81 educational games, and is a great way to mug up on those hated French lessons.

As published, any child who has done French for a few months or more could use it. No doubt I shouldn't say this, but it is simple if tedious to change the vocabulary listed to suit the older child's needs.

The stored data comprises pairs of English/French words and phrases for translation. There are three banks of 20 such pairs — nouns, verbs, adjectives.

During each run the victim is invited to select any of these, or a mixture. He or she will then be asked to translate a randomly accessed set of 10, in a randomly chosen direction.

If the input answer is correct that question will not be repeated. If it is not, it may be — and the correct version is printed out.

A bit of fun is added by the 'count-down' approach. With each new correct answer a further stage of a rocket is built up on a launchpad. When you get 10 correct answers in a row the rocket takes off, quite spectacularly too.

This program is fully mug-trapped and throughout has a very pleasing screen display.

Other programs in the series test, in a similar way, multiplication tables, English grammar, and G-level physics problems.

### Summary

A very well-designed ZX81 program that meets its aims enjoyably.

# Reviews

## hardware



### Z881 Joystick

Micro Gen, 24 Agor Crescent, Bracknell, Berkshire  
Price £9.00 each, controller board £19.00, includes VAT and postage

Micro Gen has produced a set of joysticks with which games can be played at a greater speed than using the keyboard. Each joystick produces a number between 30 and 114 at the middle range of an adjustable control mounted on the controller board.

The whole set up requires no soldering as the joystick plug into the controller board and the controller board plugs into the Z881.

It also provides a place to connect the Sinclair Printer or 16K RAM pack or whatever else you want to attach.

All the connectors to the joystick port including all the integrated circuits, are mounted to the left of the connections between the RAM pack and the Z881.

It is not possible to use this board on a Z880, even with the 6K ROM as it requires the use of the ROM chip select connection which only appears on the Z881.

The ICs make up a seven-bit analogue to digital converter (A/D), which can be switched between the four analogue inputs from the joystick. The four inputs are:

- 1 Joystick 1, UP/DOWN
- 2 Joystick 1, LEFT/RIGHT
- 3 Joystick 2, UP/DOWN
- 4 Joystick 2, LEFT/RIGHT

The numbers given are Poked into the port location 10000, which is in the memory map (the same place as the RAM is played). This selects which control you want to look at.

The result is obtained by either Peking at the same location or by using machine code by adding 05 milliseconds and then loading the re-

sult into a register. A fire button is included which operates bit 7 (adding 128 if Poked) when pressed.

Micro Gen is looking for programs to add to the Z881 readers and Maze program which use the joystick.

The board is quite stable in use and eliminates some of the wobble caused by using the keyboard. The joystick plug into two connectors on the side of the board and are then locked into place.

The cable connecting them to the board is six feet long, so there should be no eye strain. Although it is expensive, the controller board can also be used as a four-channel A/D.

### Summary

This is an easy-to-use system which can be used in machine code (recommended for speed) or Basic.



### Vic Light Pen

Stack Computer Services, 290-290 Derby Road, Liverpool 20  
Price £28.75 inc. VAT

The pen connects to the control port on the right-hand side of the Vic. The flexible wire from the port to the pen itself is long enough for the tv or monitor to be placed a number of feet away from the Vic.

The position of the light pen is detected by looking at registers 36600 (X co-ordinate) and 36671 (Y co-ordinate). This gives you an effective resolution on the screen of approaching 90 by 90.

For more efficient use of the pen this needs to be reduced to the Vic's own resolution of 22 by 23 which can easily be accomplished by a line or two of Basic.

Thus, from software you can detect the position of the pen on the screen and scale your response accordingly.

The light pen would probably be of most use in a question and answer

application, where the user is required to input an answer on the screen.

### Summary

Many users will not have encountered a microcomputer before, and will perhaps be reluctant to actually 'touch' the keyboard. This light pen gives the opportunity for getting around that problem.

### The Devil's DP Dictionary

By Stan Kelly-Boole, published by McGraw-Hill, 141 pages paperback, price £3.95

Let's start by having a look at one of the dictionary's definitions.

**"DP dictionary n** — An attempt to freeze the volatile vocabulary of an illiterate industry. This work is the first such to succeed."

It was thoughtful of Stan Kelly-Boole to include a definition of his own work. It almost makes my task as a reviewer redundant.

As you may have gathered, this dictionary is not a serious attempt to provide an explanation of the curious words and phrases that abound in computing. In fact it is the reverse. With this delightful book on your bedside table, your laughter will keep your partner awake for hours.

But paradoxically there is a serious side to the dictionary. It pokes fun at all sectors of the computing industry, from IBM — "Iron Business Machines" — to the consultant — "Iron don't do default, dupe, unwind or, possibly French coin (vulgar)" "a person of little merit" + a euphemistic form of "inert". In poking a few eggs like this, the book offers important messages for people in all sectors of the industry.

Here are a few more extracts to keep you amused.

**Binary ad** — Relating to a number system misapplied to protect children from parental help during maths homework assignments.

**merendicity sequence n** — The basic sequence in ascending order, i.e. less, damn less, statistics, damn statistics, benchmarks, delivery promises.

### Summary

An unbeatable book to relax with, that also provides much food for thought.

# Open Forum

OPEN FORUM is for you to publish your programs and ideas. It is important that you make sure your programs are bug-free before you send them in. We cannot test all of them.

As far as possible always send us a computer printed listing, made immediately after you have run the program.

Each program should include a description of what the program does, how to use it and how the program has been written.

Your contributions should be sent to Open Forum, Popular Computing Weekly, Hobhouse Court, 12 Whitcomb's Street, London WC2H 7HF with a stamped addressed envelope. We will pay £10 for each contribution published.

## Pixel drawer

2281

We've tried to keep this program short as possible to allow the maximum memory space for the actual picture. The cursor is steady when it is drawing, and flashing when it's not.

Pressing B switches from 'plot' to 'don't plot' and back. When the program is run, you enter the X and Y plotting co-ordinates you want to start from.

```

10 INPUT
20 INPUT "X="
30 LET P=X
40 LET R=CODE INKEY$-50
50 IF P=0 THEN GOTO 1
60 GOTO 100
70 PLOT "X,Y"
80 IF R=0 THEN LET P=CODE RND P-1
90 GOTO 40
100 LET Y=0:GOTO 100 OR P=0 OR R=0: Y=Y+RND 1-1
110 LET Y=0:GOTO 110 AND R=0:Y=Y+RND 1-1
120 RETURN

1300 FOR I=0 TO 1
1400 FOR J=0 TO 2
1500 FOR K=0 TO 3
1600 FOR L=0 TO 4
1700 FOR M=0 TO 5
1800 FOR N=0 TO 6
1900 FOR O=0 TO 7
2000 FOR P=0 TO 8
2100 FOR Q=0 TO 9
2200 FOR R=0 TO 10
2300 FOR S=0 TO 11
2400 FOR T=0 TO 12
2500 FOR U=0 TO 13
2600 FOR V=0 TO 14
2700 FOR W=0 TO 15
2800 FOR X=0 TO 16
2900 FOR Y=0 TO 17
3000 FOR Z=0 TO 18
3100 FOR AA=0 TO 19
3200 FOR AB=0 TO 20
3300 FOR AC=0 TO 21
3400 FOR AD=0 TO 22
3500 FOR AE=0 TO 23
3600 FOR AF=0 TO 24
3700 FOR AG=0 TO 25
3800 FOR AH=0 TO 26
3900 FOR AI=0 TO 27
4000 FOR AJ=0 TO 28
4100 FOR AK=0 TO 29
4200 FOR AL=0 TO 30
4300 FOR AM=0 TO 31
4400 FOR AN=0 TO 32
4500 FOR AO=0 TO 33
4600 FOR AP=0 TO 34
4700 FOR AQ=0 TO 35
4800 FOR AR=0 TO 36
4900 FOR AS=0 TO 37
5000 FOR AT=0 TO 38
5100 FOR AU=0 TO 39
5200 FOR AV=0 TO 40
5300 FOR AW=0 TO 41
5400 FOR AX=0 TO 42
5500 FOR AY=0 TO 43
5600 FOR AZ=0 TO 44
5700 FOR BA=0 TO 45
5800 FOR BB=0 TO 46
5900 FOR BC=0 TO 47
6000 FOR BD=0 TO 48
6100 FOR BE=0 TO 49
6200 FOR BF=0 TO 50
6300 FOR BG=0 TO 51
6400 FOR BH=0 TO 52
6500 FOR BI=0 TO 53
6600 FOR BJ=0 TO 54
6700 FOR BK=0 TO 55
6800 FOR BL=0 TO 56
6900 FOR BM=0 TO 57
7000 FOR BN=0 TO 58
7100 FOR BO=0 TO 59
7200 FOR BP=0 TO 60
7300 FOR BQ=0 TO 61
7400 FOR BR=0 TO 62
7500 FOR BS=0 TO 63
7600 FOR BT=0 TO 64
7700 FOR BU=0 TO 65
7800 FOR BV=0 TO 66
7900 FOR BW=0 TO 67
8000 FOR BX=0 TO 68
8100 FOR BY=0 TO 69
8200 FOR BZ=0 TO 70
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9300 FOR CK=0 TO 81
9400 FOR CL=0 TO 82
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1490 FOR EO=0 TO 137
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4170 FOR OW=0 TO 405
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4360 FOR PP=0 TO 424
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4880 FOR RP=0 TO 476
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5430 FOR TS=0 TO 531
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5760 FOR UZ=0 TO 564
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5980 FOR VV=0 TO 586
5990 FOR VW=0 TO 587
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6670 FOR YM=0 TO 655
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6890 FOR ZI=0 TO 677
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6920 FOR ZL=0 TO 680
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7010 FOR ZU=0 TO 689
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7090 FOR AC=0 TO 697
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7170 FOR AK=0 TO 705
7180 FOR AL=0 TO 706
7190 FOR AM=0 TO 707
7200 FOR AN=0 TO 708
7210 FOR AO=0 TO 709
7220 FOR AP=0 TO 710
7230 FOR AQ=0 TO 711
7240 FOR AR=0 TO 712
7250 FOR AS=0 TO 713
7260 FOR AT=0 TO 714
7270 FOR AU=0 TO 715
7280 FOR AV=0 TO 716
7290 FOR AW=0 TO 717
7300 FOR AX=0 TO 718
7310 FOR AY=0 TO 719
7320 FOR AZ=0 TO 720
7330 FOR BA=0 TO 721
7340 FOR BB=0 TO 722
7350 FOR BC=0 TO 723
7360 FOR BD=0 TO 724
7370 FOR BE=0 TO 725
7380 FOR BF=0 TO 726
7390 FOR BG=0 TO 727
7400 FOR BH=0 TO 728
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7420 FOR BJ=0 TO 730
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7490 FOR BQ=0 TO 737
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7670 FOR CI=0 TO 755
7680 FOR CJ=0 TO 756
7690 FOR CK=0 TO 757
7700 FOR CL=0 TO 758
7710 FOR CM=0 TO 759
7720 FOR CN=0 TO 760
7730 FOR CO=0 TO 761
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7750 FOR CQ=0 TO 763
7760 FOR CR=0 TO 764
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7780 FOR CT=0 TO 766
7790 FOR CU=0 TO 767
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7810 FOR CW=0 TO 769
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7840 FOR CZ=0 TO 772
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7870 FOR DC=0 TO 775
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7940 FOR DJ=0 TO 782
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7960 FOR DL=0 TO 784
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7980 FOR DN=0 TO 786
7990 FOR DO=0 TO 787
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8010 FOR DQ=0 TO 789
8020 FOR DR=0 TO 790
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8050 FOR DU=0 TO 793
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8070 FOR DW=0 TO 795
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8090 FOR DY=0 TO 797
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8170 FOR EG=0 TO 805
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8190 FOR EI=0 TO 807
8200 FOR EJ=0 TO 808
8210 FOR EK=0 TO 809
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8250 FOR EO=0 TO 813
8260 FOR EP=0 TO 814
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8280 FOR ER=0 TO 816
8290 FOR ES=0 TO 817
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8320 FOR EV=0 TO 820
8330 FOR EW=0 TO 821
8340 FOR EX=0 TO 822
8350 FOR EY=0 TO 823
8360 FOR EZ=0 TO 824
8370 FOR FA=0 TO 825
8380 FOR FB=0 TO 826
8390 FOR FC=0 TO 827
8400 FOR FD=0 TO 828
8410 FOR FE=0 TO 829
8420 FOR FF=0 TO 830
8430 FOR FG=0 TO
```

# Open Forum

Vi is not allowed to go off either side of the screen.

This program uses a REPEAT/UNTIL loop (see lines 100 and 270) to keep it running until the loop is exited by line 200.

Note in line 270 it says UNTIL FALSE. This means that the loop will continue for ever, unless there is an exit condition within the loop which is satisfied, or the BREAK key is pressed.

If you'd like to slow the program down, change the one at the end of the SOUND statement in line 250 into a two or a three, and/or change the one in brackets into two or three in line 250.

## Machine code loader Z801

The program has five functions. You can enter one or two bytes of decimal (so full address, eg 16384, can be entered) or 1 byte hex. You can print what you've entered so far on to the screen (if the screen fills up then press 'cont'), and run your machine code program.

In addition, the address of last byte entered and its decimal contents are displayed at the top of the visual display screen.

## Snakes alive Vi

This program works with an unexpanded Vi. You are in control of a moving snake which is contained within the Vi's screen. The snake is slowly growing, and you have to prevent its head from hitting both the sides of the case and its own tail. To score points move the head of the snake over the boxes which appear randomly as the snake is moving.

This is a lot more difficult than you might at first think.

The snake is controlled by using either arrows or up-arrows to move vertically and semicolon or equals to move to the left. Return and shift are big enough to hit during moments of panic!

It is a fairly simple task to convert the program to work with a joystick — see page 216 of *The Vi Revealed* by Nick Humphreys.

Lines 300 to 330 are the ones to change if a joystick is to be used.

See page 14 for the listing of *Snakes alive*.

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**Road runner**  
by Tim Harford

```
10 REM
20 LET A=16514
25 CLS
30 PRINT A-1 PEEK (A-1)
40 PRINT "1=1+DEC,2=2+DEC,3=1+HEX"
45 PRINT "4=PRINT,5=RUN"
50 PRINT
60 INPUT S
70 GOTO 3+208
400 PRINT S;" +DEC"
410 INPUT C
420 POKE A+1,INT (C/256)
430 POKE A,C-256+PEEK (A+1)
440 LET A=A+8
450 GOTO 25
600 PRINT "1+HEX"
610 INPUT A#
620 POKE A,16*(CODE (A#)-28)+CODE (A#),2)-28
630 LET A=A+1
640 GOTO 25
900 CLS
910 FOR C=16514 TO A
920 PRINT C;PEEK C
930 NEXT C
940 INPUT A#
950 GOTO 25
1200 PRINT USP 16514
99 REM Insert 40 graphic spaces after the RPE statement in line 10
```

**Machine code loader**  
by Paul Garvan

# Open Forum

## Snakes alive by Dave Middleton

```

10 PRINT"THE SNAKES ALIVE"
15 CLS
20 INPUT"INSTRUCTIONS",Z:IFASC(Z)=7800TO100
30 GOTO1000
40 GETC:IFC="000000
100 DIMP(20) B(2)
110 D=0:Z=20 B(1)=40 B(2)=42 B(3)=38
120 T=7800 H=3333 PRINTCHR$(12)
130 H1=30070 H2=30070 H3=30070
140 PRINT"0 SCORE 0"
145 FOR J=30400 TO 30495 POKEJ,2 NEXTJ
150 FORJ=7790 TO 7720 POKEJ,81 POKES=462.61 NEXTJ
160 FORJ=7790 TO 6640 STEP25 POKESJ,41 POKESJ=21.61 NEXT
170 V=18 H=11 V1=0 H1=1 P2=18 B1=1
180 T1="000000"
190 PRINT"0" V10=H1:T1=3>IFTD=60070400
200 GETC:IFC="000000
210 IF Z=C>P(1):THEN Z=2 B1=2 D=1.5 V1=0 H1=1
215 IF Z=" " OR Z=C<P(1)THEN Z=1 B1=1 D=1.5 V1=0 H1=1
220 IF Z="e" OR Z="t"THEN Z=3 B1=3 D=1.5 V1=1 H1=0
230 IF P(2)=65374 THEN Z=0 B1=0 D=1.5 V1=1 H1=0
240 V=V-V1 B=H+D
245 P=7800+V*256
250 P0=PEEK(P) P0ERS1,15 P0ERS2,20H3+128 P0ERS3,15
260 P=C>P0 B=4741 (P0>P2)THENB7=0
270 P1=P/256 P1=67+P P0=67 0 (P1<V)THENP0ERS1,32
280 P0ERS1,D(1) P1=P0ERS1 (P1<0)THENP0ERS1,32
290 (P0>C)GOTO400
300 (P0ERS1,15)GOTO1000
310 P0ERS1=V2-17042+1 P3=V*422+19 P0ERS1=H2-17042+1 (P0ERS1<P3+H3)>C)GOTO1000
320 P0ERS1=H3-38
330 NEXTH2 V2 T=0 P0ERS1,32
340 V2=INT(P0ERS1/1024)+2 H2=INT(P0ERS1/1024)+1
350 P0ERS1=V2-17042+1 P3=V*422+19 P0ERS1=H2-17042+1 (P0ERS1<P3+H3)>C)GOTO1000
360 H2=V2+V2 P0ERS1=V2-17042+1 P3=V*422+19 P0ERS1=H2-17042+1
370 P0ERS1,15 P0ERS1,178
380 P0ERS1=H1+182 P0ERS1,9
390 H2=V2+V2 T=3+H2(1) P3=V*422+19 P0ERS1,49+T GOTO1000
400 (P0ERS1,15)GOTO400
410 T=T+1
420 T=T-1 B=1: P0ERS1,15 P0ERS2,130+T*5
430 PRINT"00000000000000000000"
440 B1=10+H1+H2+T*5 P0ERS1,3 NEXT P0ERS1,0 (P0ERS1=60070400
450 P=P+1 T1=H1+T*100010
460 P0ERS1,15 P0ERS2,15 P0ERS3,200 P0ERS1=1701000 NEXT
470 P0ERS1,0
480 PRINT"00000000000000000000"
490 GETC:IFC="000000
500 (P0ERS1,15)GOTO1000
510 (P0ERS1,15)GOTO1000
520 PRINT"00000000000000000000"
5300 PRINT"00000000000000000000"
5400 PRINT"00000000000000000000" WITH P0ERS1 IF
5500 PRINT"00000000000000000000"
5600 PRINT"00000000000000000000"
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6000 PRINT"00000000000000000000"
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9000 PRINT"00000000000000000000"
9100 PRINT"00000000000000000000"
9200 PRINT"00000000000000000000"
9300 PRINT"00000000000000000000"
9400 PRINT"00000000000000000000"
9500 PRINT"00000000000000000000"
9600 PRINT"00000000000000000000"
9700 PRINT"00000000000000000000"
9800 PRINT"00000000000000000000"
9900 PRINT"00000000000000000000"
1000 RETURN

```

# Open Forum

## Statistical program

2200

This program, written by Ken Mahogany for a 10K ZX81, can easily be broken down into four programs, each of which will fit within 5K of computer memory.

To get it into 1K, just enter the line numbers from 1000 to 1500, 2000 to 2500, 3000 to 3500 or 4000 to 4500. You'll also have to assign COUNT and TOTAL for each program.

The four programs are:

**Arithmetic mean:** this is simply the average of a set of numbers.

**Geometric mean:** the geometric mean is the  $n$ th root of the product of the numbers, where  $n$  is the total number of numbers entered.

**Harmonic mean:** the harmonic mean is derived from the reciprocals of the entered numbers.

**Factorial:** a factorial is the progression  $A \times (A-1) \times (A-2) \times (A-3)$  down to  $(A-2) \times (A-1)$  where  $A$  is the integer entered in line 4000. As this only works with integers, line 4040 changes any non-integer entry into an integer.

The routine from line 5000 presents a menu of choices. Note the use of GOTO A+1000 in line 5600. This is a shorthand way of saying:

IF A = 1 THEN GOTO 1000

IF A = 2 THEN GOTO 2000

IF A = 3 THEN GOTO 3000

IF A = 4 THEN GOTO 4000

IF A = 5 THEN GOTO 5000

You can often make use of this technique in menu-driven programs.

## Noughts and Crosses

2201

Here is an elaborate, and extremely hard to beat, version of noughts and crosses, written for a ZX81 with more than 1K, by Graham Charlton.

You have the option of going first or second in the game. You are the Os, the ZX81 is the Xs.

Wait for the board to change before entering your move, which you do simply by entering the number (one to nine) of the square into which you want to move.

Now how this program makes use of the ZX81's string-storing ability (for example, lines 20 to 40).

Play this game in SLOW mode. The program does not say who has won as the game has to be played out completely.

See page 16 for the listing of Noughts and Crosses.

## Statistical program

by Ken Mahogany

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1000 REM ***** ARITHMETIC PROGRAM
1010 PRINT "ARITHMETIC"
1020 PRINT "ARITHMETIC MEAN"
1030 PRINT "ENTER THE NUMBERS YOU WISH ME"
1040 PRINT "THE 5 TO AVERAGE FOR YOU"
1050 PRINT "ENTER 5 TO END YOUR INPUT"
1060 GOTO 20
1070 LET SUM=0 THEN GOTO 1400
1080 PRINT "OK"
1090 LET TOTALTOTAL=SUM, 0
1100 LET COUNT=COUNT+1
1110 LET SUM=SUM
1120 PRINT
1130 PRINT "THE ARITHMETIC MEAN IS " TOTAL/COUNT
1140 GOTO 2000
1150 REM GEOMETRIC MEAN
1160 PRINT "GEOMETRIC MEAN"
1170 PRINT "ENTER THE NUMBERS YOU WISH ME"
1180 PRINT "THE 5 TO FIND THE GEOMETRIC MEAN"
1190 PRINT "ENTER 5 TO END YOUR INPUT"
1200 LET TOTAL=1
1210 GOTO 20
1220 IF SUM THEN GOTO 2500
1230 PRINT "OK"
1240 LET TOTALTOTAL=1
1250 LET COUNT=COUNT+1
1260 LET TOTAL=TOTAL*SUM, 0
1270 GOTO 20
1280 PRINT "THE GEOMETRIC MEAN IS " TOTAL/((COUNT)
1290 GOTO 2000
1300 REM HARMONIC MEAN
1310 PRINT "HARMONIC MEAN"
1320 PRINT "ENTER THE NUMBERS YOU WISH ME"
1330 PRINT "THE 5 TO FIND THE HARMONIC MEAN"
1340 PRINT "ENTER 5 TO END YOUR INPUT"
1350 GOTO 20
1360 IF SUM THEN GOTO 3500
1370 PRINT "OK"
1380 LET TOTAL=1
1390 LET COUNT=COUNT+1
1400 GOTO 20
1410 PRINT
1420 GOTO 1400
1430 REM FACTORIAL
1440 PRINT "FACTORIAL"
1450 PRINT "ENTER THE NUMBER YOU DESIRE"
1460 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
1470 GOTO 20
1480 LET SUM=1
1490 IF SUM=1 TO SUM
1500 LET SUM=SUM
1510 GOTO 20
1520 PRINT
1530 GOTO 1400
1540 REM FACTORIAL
1550 PRINT "FACTORIAL"
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8680 GOTO 1400
8690 REM FACTORIAL
8700 PRINT "FACTORIAL"
8710 PRINT "ENTER THE NUMBER YOU DESIRE"
8720 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
8730 PRINT "ENTER 5 TO END YOUR INPUT"
8740 LET SUM=1
8750 IF SUM=1 TO SUM
8760 LET SUM=SUM
8770 GOTO 20
8780 PRINT
8790 GOTO 1400
8800 REM FACTORIAL
8810 PRINT "FACTORIAL"
8820 PRINT "ENTER THE NUMBER YOU DESIRE"
8830 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
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8860 IF SUM=1 TO SUM
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8880 GOTO 20
8890 PRINT
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8910 REM FACTORIAL
8920 PRINT "FACTORIAL"
8930 PRINT "ENTER THE NUMBER YOU DESIRE"
8940 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
8950 PRINT "ENTER 5 TO END YOUR INPUT"
8960 LET SUM=1
8970 IF SUM=1 TO SUM
8980 LET SUM=SUM
8990 GOTO 20
9000 PRINT
9010 GOTO 1400
9020 REM FACTORIAL
9030 PRINT "FACTORIAL"
9040 PRINT "ENTER THE NUMBER YOU DESIRE"
9050 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
9060 PRINT "ENTER 5 TO END YOUR INPUT"
9070 LET SUM=1
9080 IF SUM=1 TO SUM
9090 LET SUM=SUM
9100 GOTO 20
9110 PRINT
9120 GOTO 1400
9130 REM FACTORIAL
9140 PRINT "FACTORIAL"
9150 PRINT "ENTER THE NUMBER YOU DESIRE"
9160 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
9170 PRINT "ENTER 5 TO END YOUR INPUT"
9180 LET SUM=1
9190 IF SUM=1 TO SUM
9200 LET SUM=SUM
9210 GOTO 20
9220 PRINT
9230 GOTO 1400
9240 REM FACTORIAL
9250 PRINT "FACTORIAL"
9260 PRINT "ENTER THE NUMBER YOU DESIRE"
9270 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
9280 PRINT "ENTER 5 TO END YOUR INPUT"
9290 LET SUM=1
9300 IF SUM=1 TO SUM
9310 LET SUM=SUM
9320 GOTO 20
9330 PRINT
9340 GOTO 1400
9350 REM FACTORIAL
9360 PRINT "FACTORIAL"
9370 PRINT "ENTER THE NUMBER YOU DESIRE"
9380 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
9390 PRINT "ENTER 5 TO END YOUR INPUT"
9400 LET SUM=1
9410 IF SUM=1 TO SUM
9420 LET SUM=SUM
9430 GOTO 20
9440 PRINT
9450 GOTO 1400
9460 REM FACTORIAL
9470 PRINT "FACTORIAL"
9480 PRINT "ENTER THE NUMBER YOU DESIRE"
9490 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
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9850 IF SUM=1 TO SUM
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9880 PRINT
9890 GOTO 1400
9900 REM FACTORIAL
9910 PRINT "FACTORIAL"
9920 PRINT "ENTER THE NUMBER YOU DESIRE"
9930 PRINT "THE 5 TO FIND THE FACTORIAL MEAN"
9940 PRINT "ENTER 5 TO END YOUR INPUT"
9950 LET SUM=1
9960 IF SUM=1 TO SUM
9970 LET SUM=SUM
9980 GOTO 20
9990 PRINT
1000 GOTO 1400

```

# Open Forum



**Naughts and crosses**  
by Graham Duxton

## Poetry

This program was written for an unexpanded Vic, but there should be no problem in translating it to work with any other machine. Here are a few examples of the sort of poetry it produces.

Molten, flaking  
fiercely splendidly burning  
Courageously flaking, splendidly  
splendid  
Ingots shift dangerously  
Splendidly flaking  
Machines yearn  
Glowing devices  
Molten incandescent years

## Home accounts

This is a fairly simple, but very useful personal accounts program. When you first RUN it, you'll see that the balance is zero.

You can work out a series of accounts by using GOTO 78 instead of RUN, to keep the 'previous balance' (variable B) intact.

Note that the Commodore printer has turned all the pound signs into a single apostrophe ('). Enter these as pound signs.

The program is set up to deal with six categories — cheques, credit cards, rates, mortgage, standing orders, and notes in — as well as a seventh, salary earned, but can easily be modified to handle as many categories as you like.

To handle more categories simply change the six in line 40 (M = 6) to the number of categories you need. As well as this, you'll have to add additional data in the ON F GOTO line (line 190) as the computer will have extra destinations for additional categories. You do this by adding the categories before the start of the initialization procedure (line 400).

Note that incomes in are recorded as negative numbers and will be shown as such in the display.

It would be very easy to modify this program to give you the option of dumping the accounts on to a printer. The modification should be entered between lines 210 and 220.

Note the use of the GET function in line 540 to stop the program until any key is pressed.

See page 18 for the full listing of Home accounts.

```

10 GOTO 1000
20 PRINT AT 5.11, "A: 1 TO 11:"
30 PRINT AT 7.11, "B: 12 TO 21:"
40 PRINT AT 9.11, "C: 22 TO 31:"
50 RETURN
60 GOSUB 20
70 IF B=9 THEN GOTO 1000
80 IF B=3 AND (A(1)=1 AND A(2)=1 OR A(3)=1 AND A(7)=1)
  THEN LET B=6
90 LET B=B+1
10 FOR C=2 TO 3 STEP 4
110 FOR A=1 TO 3
120 IF A(1)+A(2)+A(3)+A(4)+A(5)+A(6)=9 THEN GOTO 100
130 NEXT A
140 IF A(1)+A(2)+A(3)+A(4)+A(5)+A(6)=9 THEN GOTO 200
150 IF A(1)+A(2)+A(3)+A(4)+A(5)+A(6)=9 THEN GOTO 250
160 NEXT C
170 FOR C=1 TO 3
180 LET B=9AL B=C
190 IF A(1)=9 THEN GOTO 260
200 NEXT C
210 LET B=9AL B=2
220 IF A(1)=9 THEN GOTO 260
230 IF A(1)=9 THEN GOTO 260
240 GOTO 260
250 LET B=9AL B=3
260 IF A(1)=9 THEN GOTO 260
270 LET B=9AL B=4
280 GOTO 260
290 IF B=9 THEN GOTO 1000
300 LET B=9AL B=5
310 IF B=9 THEN GOTO 1000
320 LET A(1)=9, A(2)=9, A(3)=9, A(4)=9, A(5)=9, A(6)=9
330 LET A(1)=9, A(2)=9, A(3)=9, A(4)=9, A(5)=9, A(6)=9
340 LET B=9AL B=6
350 GOTO 260
360 LET A(1)=9, A(2)=9, A(3)=9, A(4)=9, A(5)=9, A(6)=9
370 LET A(1)=9, A(2)=9, A(3)=9, A(4)=9, A(5)=9, A(6)=9
380 IF A(1)=9, A(2)=9, A(3)=9, A(4)=9, A(5)=9, A(6)=9
390 LET B=9AL B=7
400 GOTO 260
410 PRINT AT 16.2, "DO YOU WANT TO DO FIRST? (Y/N)"
420 LET B=9AL B=8
430 IF B=9 THEN GOTO 1000
440 PRINT AT 16.2, " "
450 FOR B=1 TO 6
460 PRINT AT 16.2, " "
470 NEXT B
480 PRINT AT 5.11, "*****"
490 PRINT AT 7.11, "*****"
500 LET B=9
510 IF B=9 THEN GOTO 1000
520 GOTO 60

```

All The hash sign (#) signifies a graphic space



# Open Forum

```

100 PRINT"POETRY      JIM BUTTERFIELD"
110 INPUT"INSTRUCTIONS Y/N?";Z$
120 IFASC(Z$)=76GOTO300
130 PRINT"THIS PROGRAM WRITES POEMS..."
140 PRINT"YOU CAN CHANGE IT TO WRITE POEMS",
150 PRINT"OF YOUR CHOICE BY CHANGING THELIST",
160 PRINT"OF WORDS .. FOUNDIN DATA STATEMENTS",
170 PRINT"FROM 300 TO 400. YOU CAN ALSO CHANGE",
180 PRINT"THE LINE STRUCTURE."
190 PRINT"JUST PUT IN THE TYPE OF WORDS THAT",
200 PRINT"SUITS THE TYPE OF POEM YOU WANT..."
210 PRINT"FOR SCENIC POEMS - 'HILLS,FIELDS,TRAILS..."
220 PRINT"ROMANTIC - 'LIPS,EYES,SOFT,LOVELY..."
230 PRINT"MOODS - DARK,BROODING,GRIM..."
240 PRINT"DO YOUR OWN THING..."
250 PRINT"....START BY HITTINGANY KEY."
260 GET Z$: IFZ$=""GOTO370
270 DATA TRANSISTORS,CIRCUITS,TRACTORS
280 DATA MACHINES,COMPUTERS,FACTORIES,DEVICES,HAMMERS,INDOORS,RIVETS,H
290 REM ABOVE WAS THERE NOUNS
300 DATA YEARN,PINE WAIL,BEARN,FLOAT,GLISTEN,DRIFT,V
310 REM ABOVE WAS THERE VERBS
320 DATA MOLTEN,GLOWING,BURNING,STRIDENT,BRIGHT,FLASHING,J
330 REM ABOVE WAS THERE ADJECTIVES
340 DATA BRAVELY,FERCELY,ARIDLY,COURAGEOUSLY,ECSTATICALLY,SPLENDIDLY,A
350 REM ABOVE WAS THERE ADVERBS
360 DATA "A,H" "MY,MAY,IN,JUST","J,J","HWA,AJ,AAJ","AJ,AJ",JHW,JAHA,"MY,MW","B"
370 REM ABOVE WAS LINE STRUCTURES
400 T=1
410 T=T/1000:J=INT(-T): IFJ=>1GOTO460
420 DIMA$(100),K$(6),E$(6)
430 C=0: H=0: E(0)=1
440 READH$
450 IFH$=""GOTO560
460 IFLEN(H$)>10ORPS=""*THEH$=H$: H$(0)=H$:GOTO520
470 C=C+1: E(C)=H$: K$(C)=H$: PS=H$:GOTO520
480 T=H$-E(C-1)
490 PRINT"Q?" L=INT(RND(1)*5)+3
500 FOR LI=1TO L
510 S=INT(RND(1)*T)+E(C-1)
520 G$=H$(S)
530 FORJ=1TOLEN(G$)
540 K$=MID$(G$,J,1)
550 FORK=1TOC-1: IFK=K$(K)GOTO600
560 NEXTK: PRINTK
570 NEXTJ: PRINT
580 NEXTLI
590 GETZ$: IFZ$=""GOTO690
600 T2=T+1200: PRINT"ONE ANOTHER POEM? Y/N",
610 GETZ$: IFZ$=""GOTO670
620 Z$="Y": IFZ2>1GOTO670
630 IFASC(Z$)>C-76GOTO570
640 END
650 S=INT(ABS(X1)*E(K)-E(K-1))/E(K-1)
660 PRINT" ",A$(S),: GOTO660

```

## Poetry

by Jim Butterfield

# Open Forum

```

10 REM #HOME ACCOUNTS#
20 REM (C) HARTNELL/ROH JONES
25 REM FROM "LET YOUR BASIC MICRO
26 REM      TEACH YOU TO PROGRAM"
30 MODE 7
40 M=0
50 DIM A(6)
60 PROC INITIALISE
70 GOSUB 230
80 INPUT "ANY CHANGES (Y OR N)?":Z
90 IF Z="N" THEN 200
100 SOUND 1,-7,RND(50)+75.3
110 INPUT "NUMBER?":K IF K=0 OR K<1 THEN 110
120 SOUND 1,-7,RND(50)+75.1
130 INPUT "NEW AMOUNT?":E
140 IF K=6 E=E
150 RND=E
160 GOTO 70
170 PRINT F
180 ON F GOSUB 330,340,350,360,370,380
190 PRINT TAB(4);"";A(F)
200 INPUT "SALARY?":DOSUB 230 R=3-F+0
210 PRINT "BALANCE "";R 3=R
220 END
230 T=0 CLS PRINT "TAB(12);CHR$(120+RND(5));"PERSONAL ACCOUNTS"
240 PRINT TAB(4);"PREVIOUS BALANCE "";B'
250 FOR F=1 TO 6
260 SOUND INT(F/2);-RND(15);F*20,RND(6)
270 PRINT "F.
280 ON F GOSUB 330,340,350,360,370,380
290 PRINT "";R(F)
300 T=T+R(F)
310 NEXT F
320 RETURN
330 PRINT CHR$(130);"CHECKS OUT". RETURN
340 PRINT CHR$(129);"CREDIT CARD-5)". RETURN
350 PRINT CHR$(130);"RATES". RETURN
360 PRINT CHR$(131);"MORTGAGE". RETURN
370 PRINT CHR$(132);"STANDING ORDERS". RETURN
380 PRINT CHR$(133);"MONEY IN". RETURN
390 REM *****
400 DEF PROCINITIALISE
410 CLS
420 B=0
430 SOUND 1,-5,100,7
440 PRINT "CHR$(129);"THIS IS A PERSONAL ACCOUNTS PROGRAM"
450 PRINT CHR$(130);"TO SAVE THE BALANCE AFTER AN EARLIER"
460 PRINT CHR$(130);"RUN, USE GOTO 70 RATHER THAN RUN."
470 PRINT "CHR$(131);"THE PROGRAM IS SET UP AT PRESENT"
480 PRINT CHR$(131);"TO CATER FOR SIX ITEMS. -IF YOU NEED"
490 PRINT CHR$(131);"TO HAVE MORE, CHANGE THE "VALUE OF M"
500 PRINT CHR$(131);TAB(6);"IN LINE NUMBER 40."
510 PRINT TAB(6);"NOTE THAT";CHR$(129);"MONEY IN"
520 PRINT TAB(4);"IS SHOWN AS A NEGATIVE NUMBER"
530 PRINT "CHR$(132);"PRESS ANY KEY TO START THE PROGRAM..."
540 Z=GET
550 ENDPROC

```

**Home accounts**  
by Tim Hartnell

# Sound & vision

## This machine's a dedicated musician

The Roland TR-808 is a dedicated microcomputer. It's sole purpose in life is to make rhythms. As a computer it's "user-friendly" — that is to say using it is just easy. As a drum machine it is totally flexible, almost any rhythmic pattern you could ever want can be programmed. A single pattern up to 768 measures long is possible.

There are nominally 11 different instrument sounds plus an accent, all of which can be located at any point within a bar or measure. I say "nominally" because although only 11 different sounds can be used in any one program, five of the sounds can be switched to produce alternative sounds. In normal synthesizer nomenclature these sounds would be referred to as "Voices".

Some of the parameters of some of the voices can be altered to suit individual taste. All of the voices have separate volume controls.

Looking at the voices from left to

right, you come first to the accent voice. This isn't really a voice at all when it is used it gives an emphasis to any other voice programmed on the same step. The level of volume control sets the amount of emphasis to be given.

The drum voices are very realistic and not at all dry. At the rear of the machine is an output jack for each individual voice. They enable professional users to individually treat each voice before sending it to a mixing desk.

In addition there are two jacks that provide a mixed output, the levels being set by the volume control for each voice.

The individual outputs are not affected by the level controls, but when a jack plug is inserted into an individual voice output, that voice is deleted from the main mix.

You can set the tone and decay of the bass drum to virtually any level. I had the bass voice to be a little "heavy" and so I use it only sparingly.

The snare drum also has a tone control and a snappy control. "Snappy" controls the amount of noise pro-



The Roland TR-808 drum machine

duced in the sound, and can give the impression that the drum is being tightened up.

There are three tom-toms, which double as congas to give that funky Latin sound.

Rim shot doubles up with cymbal. Used sparingly cymbals can add an authentic salsa feel to a rhythm making any material pretty fashionable with minimum trouble. Rim shot is just right for reggae sounds.

Handclap, congas and three different types of cymbal voice are also available.

Like all of the kit in the Roland range, the TR-808 is easily interfaced with other instruments. **Sam Glynn**

## Micro art makes sense of the world

This is the first of a regular series of columns about the use of microcomputers, and especially the gradually-appearing BBC machine, in what are arguably the most important areas of use of small computers: art and design.

Art, because it gives a certain freedom and license to explore questions which might be a bit out-of-the-ordinary, and design because the design of the information environment and the use of the computer to present information visually must be the main ways in which we shall change and reuse some of our complex world.

This is not to say that political action art or anything else should only be done on a computer, but we can learn so much about ourselves and our problems using even a cheap micro plugged into a television.

To those of you who already have BBC machines, a piece of advice: the forthcoming manual will contain much



Artists meet the micro challenge

of interest in terms of re-assigning certain jobs to certain keys.

But in my (pre-release and therefore subject-to-change) version, some of the tricks are clearly designed for a different operating system. Those with early machines watch out!

As a test try this: a facility that deletes the red user-defined keys

along the top of the keyboard to have their normal function disabled and to generate Ascii codes — any code!

The command "FX230" followed by a comma and a number sets the "base" value — key 60, the leftmost of the red keys — to the number the rest then follow out.

Thus "FX230 129" causes the function keys to produce Ascii codes of 129 to 138 — and from 145 to 154 if they are "shifted", which adds 96.

It is probably no coincidence that this effect, using 129 as above (the example a thank) gives all the keys you need for Mode 7 Teletext graphics such as cyan text blue graphics, flashing, and so on.

(Do not despair if this doesn't work on your machine. Doubtless it will be put right.)

Finally (and again possibly not on all machines) "FX241" changes the sound channel used by the "bell" (or blaster) and "FX242" alters the pitch. A combination of channel 5 (noise) and a weird pitch should make the thing bellow at you instead of merely squeaking. Such things are always a pleasure. **Brian Reith Smith**

# Calculators

## Step right inside for the electronic striptease!

**John Gowne** explains how 'simple' calculators hide fascinating myriads

AS FAR as I know, nobody has ever said 'A pocket calculator is at things to all men'. But it would have been quite appropriate if they had.

Programmable calculators, in particular, are similar to a Russian doll which you can open to reveal a smaller doll which itself contains a smaller doll and so on.

With calculators too a myriad of deeper and deeper levels of complexity lurks beneath the surface.

The fundamental interest to the user lies in adjusting to the logic of writing programs which actually calculate what they are meant to and musing at how the information in the owner's handbook.

The latter is not always easy. Some handbooks contain examples of the worst English in print.

The next level of interest comes in studying your programs to suit the particular brand of calculator you are using. For instance, one of the most frequently used commands in programming is the GOTO which transfers the program pointer from one line to another which has been specified.

**The sky is the limit**

If you own a Casio calculator, you can show that as soon as a GOTO is encountered a search takes place backwards in the program line by line.

If the relevant line is not encountered before the beginning of the program then the search continues forwards from the original line. Although all these operations are performed in fractions of a second they can involve quite a time delay in a long program.

Other calculator manufacturers have different looping procedures. Efficient and fast programming can also be effected by judicious placing of subroutines in the memory stack.

The software complexity appears even deeper once you recognise that the calculator handbook does not define the boundary conditions of the calculator. In fact so much more than what is described in the handbook is

possible with most calculators that the sky really is the limit.

Remember that the brain of your calculator — the microchip — is an incredibly intricate network equivalent to tens of thousands of components. The expertise involved in designing one type of chip means that it is not unusual for a single range of calculators to have inside them the same basic chip.

Don't be surprised if a cheap £20 calculator uses a chip found in more expensive models. Not many Casio hi-fi owners know that they can do standard deviations on their machine although there is no mention of this in the handbook or on the keyboard.

**Mistakes can help**

The ingenuity of the chip means that occasionally mistakes are made in its design. Occasionally the mistake simply allows the user to put the calculator into a non-standard but fairly useful condition.

For example take a good old HP-41C from the shelf of your calculator museum and dust it off. Press RCL, and then simultaneously the three keys CHS, 7 and 8. If you get your fingering right you might be surprised to see that the calculator has become an electronic stop-watch.

Similarly it is possible to put the display of an HP-41C in a confused state with the following small program:

```
11000 400000
12 744 00000
13 00000
14 37 30
15 37 30
16 37 30
17 37 30
18 37 30
19 37 30
20 37 30
```

The deepest level of software complexity probably lies in the ability to communicate with the calculator in its own language of binary bits and bytes and to address various registers and flags which are normally hidden to the user — often with good reason. It is possible to make a calculator 'fresh' while doing tea later.

At this level it is the chip mistakes, or 'software bugs' in the jargon, which can be very handy indeed. It appears that most of the top-range calculators have some drink in their armour which lets one see the internal architecture.

If you have any examples of this, write us and tell us about them.

It is sometimes possible to create any binary code you wish in program memory, and consequently increase the instruction set of the device.

For instance a software bug in the HP-41C permits one to put data memory bytes into program memory and then perform sorting to produce any combination of bytes.

This can be done with the *Byte Jumper*, which goes like this:

1. Clear the entire program memory by switching the calculator on while the CLR key is depressed.
2. Assign  $\rightarrow$  to XCFY and  $\leftarrow$  to  $\leftarrow$ .
3. Enter CHS into the program memory.
4. Still in program mode press, in rapid succession CAT1 and R/S.
5. Press ALPHA, and the correction key.
6. The CHS function should now be in line 4094.
7. BST to line 4087.
8. Press the correction key twice.
9. Enter the last line TA.
10. Press GTO.
11. Press  $\leftarrow$  — the function XROM 65,21 is the 'byte jumper' and it used properly can really expand the utility of the machine.

Again if you have any pertinent examples from other devices don't be afraid to let us know.

On the hardware side, it is possible to hook some of the really fancy calculators up to much larger main-frame computers through standard interfacing devices.

Even the level of complexity isn't quite enough for the hardy souls who like to open up the insides of their calculator and probe around with an oscilloscope and voltmeter.

Once you have unravelled the various data buses and timing requirements of all the signals then you're in the position to do your own interfacing.

### Competition

There is a prize of £5 for the reader who sends in the most intriguing program to calculate  $2000!$ . Remember that  $X! = X(X-1)(X-2) \dots$ . How does it compare with the tables and why is it different?

# Programming

## How to load machine code into a ZX81

There are three tools which are essential for machine code programming — an editor/loader, an assembler and a disassembler. The most important of these is probably the editor/loader, because this makes it easier to enter the hexadecimal values of a hand-assembled machine code program into memory.

Because the ZX81 is designed to run Basic programs, the main use of machine code routines is to enhance the speed and flexibility of a Basic program.

If the machine code routines are short, they are easily stored in the text area following an REM statement in the Basic program. This entails setting up a dummy REM statement followed by a number of characters. Always use the same character, such as A.

The number of characters used should be equal to the bytes in the machine code routine. The editor is then used to find the program line and replace the characters in the REM statement with the bytes of the machine code program.

You can use the editor/loader to find the start address of the REM statement — look for the REM command token hex EA followed by a series of values equal to the Ascii code of the character used in the REM statement.

Load the editor program into the computer and use it to put the machine code bytes into the REM statements — it's a good idea to store these in the first lines of the program.

Having created these special REM statements containing the machine code routines, delete the rest of the editor program and write the program which is to use the machine code routines.

You can also use the editor program to look at the memory of a machine code program — it's great fun trying to work out what the machine code does and how it does it.

The editor program comprises three main routines to convert decimal numbers to hexadecimal numbers and vice versa. This is important because it's far easier to write a machine code program using hexadecimal numbers rather than decimals, particularly when you are calculating jump



The Basic editor/loader allows you to enter hex values into memory

addresses and double precision numbers on an eight-bit machine.

First the program requests the address of the first location in memory which you wish to examine. The contents of that location are displayed as a hex value preceded by the memory address in both decimal and hex.

To examine following memory locations press F. If you want to step back to the previous memory location press B. To enter the machine code

program into memory or to change a byte, step forwards or backwards through memory until the pointer is against the required location, then press R and enter the two hexadecimal characters. This will replace the contents of that location with the new value entered in hex format.

Be very careful whenever you are altering memory locations because it's easy to corrupt the program by changing a program byte which is not part of a REM statement. ■

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# Peek & poke

Peek your technical queries to Graham Chantler. He will poke back an answer

## Matter of interest

Philip Harrison of Fetter Road, Chislehurst writes

**Q** For a school project, I need to be able to work out how much you have to pay on a loan, when the amount involved, the interest rate, and so on changes. I think one it would be a perfect opportunity to do something worthwhile with my ZX81 — not to say much less work.

However, I have come up against a brick wall in trying to derive a suitable program, and I certainly can't work out how to convert the formulae given in school into a program which works. Could you suggest a way out of this dilemma?

**A** Unfortunately, you did not include with your question any information as to the actual formulae you met at school. However, I think I know the one which you would have been given, and have worked out the following short program which should prove useful to you.

```
10 PRINT "INPUT AMOUNT"  
20 INPUT A  
30 PRINT "INPUT INTEREST"  
40 INPUT B  
50 LET C=10000  
60 PRINT "INPUT LOAN PERIOD"  
70 INPUT D  
80 LET E=12  
90 LET F=12  
100 LET G=1000000  
110 LET H=1000000  
120 PRINT "THE ANSWER IS"  
130 PRINT A  
140 END
```

This will run on most computers which use Basic Language 150 which is an idea from Trevor Tovey from The ZX80/81/82 Book. It simply looks the display for an input as you like and a key is pressed. The computer then prints again.

## Save me!

Melanie Davidson of Carfax Lane, Newark writes

**Q** I have lost a ZX80 for some time now, and despite carefully trying to follow the instructions in the manual, have a great deal of trouble

with LOADING and SAVING. I have tried three different tape recorders, and have run one of them on batteries and from the mains. Whatever I do does not seem to improve things. Can you suggest a way of improving the load/save reliability of my ZX81, or do you think that I have a defective computer and should send it back to Sinclair?

**A** LOAD/SAVE problems with the ZX81 are very common, and it is unlikely that your computer is defective. It is more likely that you are doing something wrong in the process. I suggest you try the following:

- Always clean the heads before loading and saving
- Use computer quality tapes, preferably 1-125
- Make sure the heads from the tape recorder to the ZX81 do not wipe the head in the power supply unit
- It may sound silly, but it is very easy to plug the leads into the wrong holes, so make sure you have them in correctly
- Write a short test-line program, and run it, then — after deleting the ZX81 — attempt to load it back, trying over and over again with slightly different volume settings until you achieve a load
- Mark the spot, perhaps with a small paper arrow, and always set the recorder to this point in future

## Getting the point

Camp Theatre of Diamond Road, Devonport writes

**Q** I am writing a game for my BBC Microcomputer, in Mode 7, in which it is necessary for me to check whether a particular position on the screen is blank or not. I can't understand the manual well enough yet to find out how to do this. All I know is that the POINT command does not seem to work for me. What do you suggest?

**A** POINT, which you can use to find out the colour of a certain position, is designed to work in the graphics modes, not Mode 7, which is the normal mode. Assuming

that X is the co-ordinate of the point you wish to check screen, and Y is the vertical co-ordinate, use

```
IF POINT(X,Y)=0 THEN  
PRINT "POINT"
```

This will do whatever follows the THEN, assuming that you are checking to see if there is an object at this point.

## Light in the dark

Roger Bentley of Jackson Avenue, Sunderland writes

**Q** When I first got my ZX printer it printed really dark, but lately I've noticed it seems to be not nearly as clear. Has my printer worn out already — I've only had it a few months — or is something else wrong?

**A** It could well be that you got one of the early printers, which were supplied with what appears to be a superior kind of paper. Later when I bought more rolls from Clive, you were supplied the paper which now seems to be standard, and which is not as good — in my opinion — as the original roll. I've found that the replacement rolls do not print as heavily or as clearly as the original roll which was on my ZX computer.

## Money makers

D.J. Jackson of Lutter Houghton, Coventry writes

**Q** My friend and I have written a number of programs — games and some more serious ones — for the ZX81, and want to know if there is a simple way to turn them into money? Is there a way now to market the programs, either on tape or cassette? And what is the copyright position? If you think we could sell them, how much should we charge? And where should we advertise?

**A** If your programs are both original and well-written, you should have little difficulty making some income from them. The simplest way to do this is to submit them — in both tape and cassette form — to the major ZX81 software suppliers, such as

Big Byte, Actix and Magnetix, and see if the programs are good enough for them to sell, on a royalty basis, for you. Only submit them to one firm at a time.

Alternatively, if you have enough tape, and can write a brief explanation of what each program does and how it works, you could turn them into a book. Publishers are hungry for ZX81 manuscripts at the moment, and you may well find a ready market there.

The third way to sell software is to place your own ads in the computer magazines, and supply the software on cassette. The price you charge depends on the quality of the programs, but should be in the range 45.00 to 115.00.

## Easy conversion

Walter Cohen of Western Drive, Lagon writes

**Q** I have a number of books of computer programs which I want to convert to run on my ZX81, and I've noticed that several of these use ORN GOTO which, as you probably know, is not available on the ZX81. Is there a way of doing this?

**A** There is a simple way to translate the ORN GOTO statement which takes advantage of the way the ZX81 logic works. To convert the following line

```
ORN GOTO 100 TO 200 ORN  
enter this into your ZX81  
GOTO 100 AND 100 AND 200  
AND 100 AND 200  
AND 100
```

Another way is to rewrite the program so you can, for example, use GOTO 10000.

The simplest way but one which makes the long, nasty programs, is to use a series of IF THENs as follows

```
IF 1 THEN GOTO 100  
IF 2 THEN GOTO 200  
IF 3 THEN GOTO 300  
IF 4 THEN GOTO 400
```

Send your questions to Peek & poke, Popular Computing Weekly, Heston House, 19 Whitcomb Street, London WC2E 7HF.

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